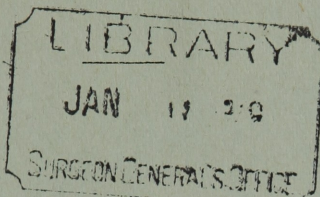


964

Smith, F. M.

INDEXED-1920.

# Tachycardia Following Influenzal Pneumonia



FRED M. SMITH, M.D.  
CHICAGO

---

*Reprinted from The Journal of the American Medical Association  
Nov. 29, 1919, Vol. 73, pp. 1685-1687*

---

COPYRIGHT, 1919  
AMERICAN MEDICAL ASSOCIATION  
FIVE HUNDRED AND THIRTY-FIVE NORTH DEARBORN STREET  
CHICAGO





## TACHYCARDIA FOLLOWING INFLUENZAL PNEUMONIA \*

---

FRED M. SMITH, M.D.  
CHICAGO

---

In many of the patients at Camp Travis, the pulse rate increased from 80 to 100, or even 120, per minute during the convalescing period of influenzal pneumonia. The pulse curve in these men showed that this increase in pulse rate began at the time they were first allowed on their feet. Frequently it was so marked that they were ordered back to bed. Others who had been discharged from the hospital to quarters or duty were returned for observation. Some complained of shortness of breath, weakness, dizziness, and palpitation of the heart on exertion. The point of especial interest was whether the influenza had produced some organic disease of the heart, such as myocarditis, or had merely served to bring into the open tachycardias that otherwise might have gone unnoticed. This report is based on the study of ninety-five such men. They were observed from the standpoint of (1) the myocardium and (2) the autonomic nervous system.

### METHOD OF STUDY

The histories of the men were carefully taken down. The points considered were (1) the family history, as relating to alcoholism, neurosis, insanity and tuberculosis; (2) general health in childhood, as pertaining to illness with acute infectious diseases, and response to games; (3) occupation in civil life, whether sedentary, light, moderate or heavy, and its effects; (4) military training, in respect to its duration, and the men's response to drill, hikes and double time, and (5) the present symptoms, with regard to their date of onset and the occasion under which they arose. The taking down of the history was followed by a physical examination and the routine laboratory work. In the physi-

---

\* From the Medical Service, Base Hospital, Camp Travis, Texas.

cal examination, special attention was given to the condition of the lungs and the heart. Those men in whom there were evidences of delayed resolution were transferred to other wards and not included in our figures. In none was there any departure from the normal in the urine, blood counts (including the differential) or in the blood pressure readings.

#### ANALYSIS OF CASES

*Irritable Heart.*—Thirty-six patients (37.8 per cent.) of the ninety-five studied gave a history of having had the symptoms of an irritable heart prior to their entrance into the army. In every instance these symptoms had been markedly aggravated by their recent illness. They were the men who, after having been discharged from the hospital to quarters, were returned because of the marked tachycardia, shortness of breath, weakness, dizziness, and palpitation of the heart on exertion.

TABLE 1.—HISTORY OF THIRTY-SIX PATIENTS WHO HAD HAD SYMPTOMS OF AN IRRITABLE HEART

Affection	No. of Cases
Hookworm .....	21
Chronic inactive pulmonary tuberculosis .....	4
Chronic malaria in childhood .....	2
Chronic bronchitis .....	3
Alcoholism .....	1
Neurotic families .....	5
Total .....	36

These men were analyzed from the standpoint of possible etiologic factors that existed in civil life. The results are shown in the accompanying table. Twenty-one (58.3 per cent.) were, or had recently been, hookworm positive. Four (11.1 per cent.) had the physical and the roentgen-ray findings of a chronic inactive pulmonary tuberculosis. Two of these tuberculous men were also positive for hookworm. Two (5.5 per cent.) gave a history of having had malaria practically every fall of their childhood life. They stated that they had always been weak. Three (8 per cent.) had the physical and the roentgen-ray findings of chronic bronchitis. This condition, from the history, had been present for years; tuberculosis was suspected but not proved. Five (13.9 per cent.) had families in which two or more members were highly neurotic.



*Hypersensitive Nervous System.*—Thirty-eight (40 per cent.) of the ninety-five men studied had what may be called a hypersensitive nervous system. We were unable to find a physical basis for their tachycardia. They were of a nervous temperament and responded readily to any external stimuli. They had a marked vasomotor instability, perspired freely, and in all respects, from a physical standpoint, presented the symptoms of an irritable heart, except that they had a greater tolerance for work. A majority of them had, to their knowledge, a rapid pulse in civil life. Not a few of them had been held up temporarily by the examining board at the time of their entrance into the army. They, however, had had no symptoms following strenuous exercises and had been admitted. They had all responded well to their military service. Following influenza, however, a few complained of weakness, shortness of breath, and palpitation of the heart on exertion, for a period of from five to six weeks.

*Hyperthyroidism.*—Twenty (21 per cent.) of the ninety-five patients studied are under observation for hyperthyroidism. The results of this work will be given in a later report.

*Organic Heart Disease.*—The diagnosis of acute myocarditis was made in only one instance in the ninety-five cases studied. The course and physical findings of the patient differed markedly from that of the other men. He had a pulse rate of 140 per minute, a definite cardiac enlargement, and a blowing systolic murmur at the apex which was transmitted to the axilla. These findings were associated with shortness of breath, palpitation of the heart, and a feeling of exhaustion on exertion. These symptoms disappeared on rest in bed. The left cardiac border receded to the midclavicular line, the murmur decreased in intensity, and the pulse rate came down to normal.

This was in sharp contrast to what occurred with the remaining ninety-five men. In them the pulse rate did not decrease with rest in bed, nor did their symptoms improve under these circumstances. They were given graded exercises regardless of their tachycardia. Had their symptoms been due to a weakened myocardium, it hardly seems possible that they would have subsided on the type of exercises that was given; for a man's response to exertion may be regarded as the

best test of his cardiac efficiency. The facts that the pulse rate of these men decreased on exercise, and that there was no change in the cardiac findings from the standpoint of murmurs and enlargement, justified us in believing that there was no organic heart disease.

#### GRADED EXERCISES

All the men except the one with acute myocarditis were given the graded exercises, as outlined by Lewis.<sup>1</sup> They were assured that they had no cardiac disease and would in time be as strong as ever. At the end of four weeks, all with the exception of four were getting a thirty-minute period of strenuous exercise twice daily, and in addition doing from a 3 to a 4 mile hike. They contended that they felt as well as ever. The pulse rate had decreased, and all had gained in weight. Some were heavier than they had ever been before in their lives. Those men who had had irritable hearts in civil life gained the most slowly. Greater care was taken in advancing the grade of their exercise. The four men who had the physical findings of a chronic inactive pulmonary tuberculosis were even slower than the rest in regaining their tolerance for work. Possibly, in many of these men there would have developed a severe type of irritable heart had they not been carefully handled. In this connection it should be added that those men who had recently been hookworm positive had had treatment. This might have been a factor in the rapid increase in strength of some of these men.

#### REPORTS FROM OTHER CAMPS

The necropsy reports from other camps are in accord with our findings. They are uniform in that few cardiac complications were observed. Hall, Stone and Simpson,<sup>2</sup> at Camp Logan, reported no cardiac complications in thirteen necropsies. Blanton and Irons<sup>3</sup> observed one case of acute myocarditis and three of acute dilatations in 123 necropsies at Camp Custer.

1. Special Report of the British Medical Research Committee, Series 8, London, 1918.

2. Hall, J. N.; Stone, M. C., and Simpson, J. C.: Epidemic of Pneumonia Following Influenza at Camp Logan, Texas, *J. A. M. A.* **71**: 1986-1988 (Dec. 14) 1918.

3. Blanton, W. B., and Irons, E. E.: A Recent Epidemic of Respiratory Infection at Camp Custer, Mich., *J. A. M. A.* **71**: 1988-1992 (Dec. 14) 1918.



Synnott and Clark,<sup>4</sup> at Camp Dix, noted no cardiac complications other than a slight dilatation of the right heart. The number of necropsies was not given. Friedlander, McCord, Sladen and Wheeler,<sup>5</sup> at Camp Sherman, reported twenty-three necropsies, noting slight dilatation of the right heart as the only cardiac complication. Nuzum, Pilot, Stangl and Bonar<sup>6</sup> saw one acute dilatation of the right heart in forty necropsies at the Cook County Hospital, Chicago. Strouse and Bloch<sup>7</sup> reported 500 cases, emphasizing the infrequency with which the myocardium was involved, as judged by clinical evidence. The reports of a detailed study of the morbid anatomy by a number of German authors,<sup>8</sup> based on the study of 174 necropsies, bear out the findings in this country. Twenty-five necropsies were performed at Camp Travis. Dilatation of the right heart was recorded in six instances, and in these hearts there was also hypertrophy of the left ventricle. This would indicate that previous damage to the heart muscle existed. The objection might be raised that microscopic examinations were not reported. It is possibly true that pathologic changes sufficient to cause serious disturbance in later life could have been easily overlooked by the naked eye. Those hearts that we studied microscopically at Camp Travis showed no significant pathologic condition.

#### ATROPIN TEST

The inhibitory action of the vagus was tested in fifty men by the administration of atropin. This was given in doses of  $\frac{1}{33}$  grain, as described by Morris,<sup>9</sup> and later by Mason,<sup>10</sup> in their work on typhoid. The patients were put to bed in a quiet room and allowed to remain until the pulse rate became constant. They

4. Synnott, M. J., and Clark, Elbert: Influenza Epidemic at Camp Dix, J. A. M. A. **71**: 1816-1821 (Nov. 30) 1918.

5. Friedlander, Alfred; McCord, C. P.; Sladen, F. J., and Wheeler, G. W.: The Epidemic of Influenza at Camp Sherman, Ohio, J. A. M. A. **71**: 1652-1656 (Nov. 16) 1918.

6. Nuzum, J. W.; Pilot, Isadore; Stangl, F. H., and Bonar, B. E.: Pandemic Influenza and Pneumonia in Large Civil Hospital, J. A. M. A. **71**: 1562-1565 (Nov. 9) 1918.

7. Strouse, Solomon, and Bloch, Leon: Notes on the Present Epidemic of Respiratory Diseases, J. A. M. A. **71**: 1568-1571 (Nov. 9) 1918.

8. Influenza: Abstracts of Foreign Literature Compiled by British Medical Research Committee: J. A. M. A. **71**: 1573 (Nov. 9) 1918.

9. Morris, F. A.: Brit. M. J. **2**: 717, 1916.

10. Mason, E. H.: Atropin Test in Typhoid Fever, Arch. Int. Med. **21**: 1 (Jan.) 1918.

were then given  $\frac{1}{33}$  grain of atropin in sulphate hypodermically in the upper arm. The reaction began usually within from fifteen to twenty minutes, and lasted from forty to sixty minutes. The height of the reaction was reached about forty minutes following the injection. Mason states that in most normal persons the pulse rate increases from twenty to forty per minute following the administration of  $\frac{1}{33}$  grain of atropin. Nineteen of the fifty men given the test had an increase in pulse rate of from 1 to 12 over the initial rate; twenty-one, from 20 to 30, and the remaining ten, from 30 to 40. According to the work of Morris and Mason, the results in the nineteen instances possibly suggest a hypotonic vagus nerve. Some of these men, however, had had, to their knowledge, a rapid pulse in civil life. In these cases we are not justified in assuming that the recent illness had had much influence on the action of the vagus nerve. Even in the remaining cases we have no basis for assuming that the action of the vagus nerve resulted from the influenzal pneumonia. It might have resulted from some infection in childhood, as diphtheria, or even have been a normal response for them.

#### EPINEPHRIN TEST

The same fifty men were given threshold doses of epinephrin. The method employed was that devised by Goetsch.<sup>11</sup> The men were put to bed in a quiet room. The pulse and blood pressure readings were taken until they became constant. An injection of 5 c.c. of a 1:1,000 solution of epinephrin was made into the deltoid muscle. Records were made of the pulse and the blood pressure every two minutes for ten minutes, and then every five minutes for one hour. Following this, observations were made at intervals of ten minutes for one-half hour.

A reaction was not considered positive unless there was an increase in the pulse rate and the blood pressure of more than from fifteen to twenty points, accompanied by marked tremor of the hands, nervousness, palpitation of the heart and increased arterial pulsation.

Twenty-five of the fifty men were sensitive to small doses of epinephrin. These men had given what is

11. Goetsch, E.: Newer Methods in the Diagnosis of Pathologic and Clinical Thyroid Disorder, New York State J. M. **18**: 259 (July) 1918.



considered a normal reaction to the atropin test. The same factors should be taken into consideration in the explanation of the results of the epinephrin test, as in explanation of those from the use of atropin. The fact that we do not know the reaction these men would have given prior to the influenzal pneumonia will not permit us to draw conclusions from the test as to the effects of this illness on the sympathetic nerve.

#### SUMMARY AND CONCLUSIONS

1. Ninety-five cases were studied. The diagnosis of acute myocarditis was made in one instance. As far as we were able to determine, organic heart disease was not the basis of the tachycardia in these men.

2. Thirty-six men (37.8 per cent.) gave a history of having had an irritable heart in civil life. These symptoms were aggravated by their recent illness. A possible etiologic factor was found in thirty-one of these cases.

3. In thirty-eight men (40 per cent.) no physical basis was found for the tachycardia. A majority had, to their knowledge, a rapid pulse in civil life.

4. Twenty men (21 per cent.) are under observation for hyperthyroidism. The results of these observations will be given in a later report.

5. Fifty men were given the atropin and the epinephrin tests. The results in nineteen suggest a hypotonic vagus nerve, and in twelve a hypersensitive sympathetic nerve. These men might, however, have given the same reaction to these tests prior to their influenzal pneumonia.

6. The graded exercises were of distinct value in estimating the state of the myocardium and in improving the general condition of these men.

122 South Michigan Avenue.

